

This listing of claims will replace all prior versions,  
and listings, of claims in the application:

1 Claim 1 (original): A method comprising:  
2 a) accepting a packet associated with a flow;  
3 b) generating a flow group identifier from the flow;  
4 c) determining whether any other packets associated with the  
5 flow group are present in a switch fabric;  
6 d) if it is determined that other packets associated with  
7 the flow group are present in the switch fabric, then  
8 assigning the packet to a path being used by the flow group,  
9 and if it is determined that other packets associated with  
10 the flow group are not present in the switch fabric, then  
11 assigning the packet to a path using path congestion status  
12 information.

1 Claim 2 (original): The method of claim 1 wherein the act of  
2 generating a flow group identifier from the flow includes hashing  
3 a flow identifier.

1 Claim 3 (original): The method of claim 1 wherein the act of  
2 determining whether any other packets associated with the flow  
3 group are present in a switch fabric includes maintaining an  
4 outstanding packet counter.

1 Claim 4 (original): The method of claim 3 wherein the outstanding  
2 packet counter is associated with the flow group identifier.

1 Claim 5 (original): The method of claim 4 wherein the act of  
2 maintaining an outstanding packet counter includes incrementing  
3 the outstanding packet counter each time a packet belonging to the  
4 flow group is sent into the switch fabric, and decrementing the

5 outstanding packet counter each time a packet belonging to the  
6 flow group leaves the switch fabric.

1 Claim 6 (original): The method of claim 5 wherein the act of  
2 decrementing the outstanding packet counter is performed in  
3 response to a message from an output port.

1 Claim 7 (original): The method of claim 6 further comprising:  
2 - passing the message from the output port to a  
3 corresponding input element,  
4 - passing the message from the corresponding input element,  
5 through the switch fabric, to another output element, and  
6 - passing the message from the other output element to  
7 another input element corresponding to the other output  
8 element, wherein the other input element originated the  
9 packet.

1 Claim 8 (original): The method of claim 3 wherein the act of  
2 maintaining the outstanding packet counter includes resetting the  
3 outstanding packet counter if it remains non-zero for more than a  
4 predetermined period of time.

1 Claim 9 (original): The method of claim 1 wherein the act of  
2 assigning the packet to a path using path congestion status  
3 information includes  
4 - selecting a switch plane having at least one uncongested  
5 path, and  
6 - selecting an uncongested path of the selected switch  
7 plane.

1 Claim 10 (original): The method of claim 9 wherein the act of  
2 selecting a switch plane having at least one uncongested path uses  
3 a round robin discipline.

1 Claim 11 (original): The method of claim 9 wherein the act of  
2 selecting an uncongested path of the selected switch plane uses a  
3 round robin discipline.

1 Claim 12 (original): A machine-readable medium having stored  
2 thereon a data structure comprising a plurality of entries, each  
3 entry including  
4 a) a flow group identifier,  
5 b) an outstanding packet in switch fabric indicator, and  
6 c) a path identifier.

1 Claim 13 (original): The machine-readable medium of claim 12  
2 further including a second data structure comprising a plurality  
3 of entries, each entry including  
4 a) the path identifier, and  
5 b) path status information.

1 Claim 14 (original): The machine-readable medium of claim 13  
2 wherein the path status information includes  
3 i) an indicator of whether or not the path has failed,  
4 and  
5 ii) an indicator of whether or not the path is  
6 congested.

1 Claim 15 (original): Apparatus comprising:  
2 a) an input for accepting a packet associated with a flow;

3        b) means for generating a flow group identifier from the  
4        flow;  
5        c) means for determining whether any other packets  
6        associated with the flow group are present in a switch  
7        fabric;  
8        d) means for assigning the packet to a path being used by  
9        the flow group if it is determined that other packets  
10       associated with the flow group are present in the switch  
11       fabric, and for assigning the packet to a path using path  
12       congestion status information if it is determined that other  
13       packets associated with the flow group are not present in the  
14       switch fabric.

1    Claim 16 (original): The apparatus of claim 15 wherein the means  
2    for generating a flow group identifier from the flow hash a flow  
3    identifier.

1    Claim 17 (original): The apparatus of claim 15 wherein the means  
2    for determining whether any other packets associated with the flow  
3    group are present in a switch fabric maintain an outstanding  
4    packet counter.

1    Claim 18 (original): The apparatus of claim 17 wherein the  
2    outstanding packet counter is associated with the flow group  
3    identifier.

1    Claim 19 (original): The apparatus of claim 18 wherein the means  
2    for maintaining an outstanding packet counter increment the  
3    outstanding packet counter each time a packet belonging to the  
4    flow group is sent into the switch fabric, and decrement the  
5    outstanding packet counter each time a packet belonging to the  
6    flow group leaves the switch fabric.

1 Claim 20 (original): The apparatus of claim 19 wherein the  
2 decrementing of the outstanding packet counter is performed in  
3 response to a message from an output port.

1 Claim 21 (original): The apparatus of claim 20 further  
2 comprising:

- 3 - means for passing the message from the output port to a  
4 corresponding input element,
- 5 - means for passing the message from the corresponding input  
6 element, through the switch fabric, to another output  
7 element, and
- 8 - means for passing the message from the other output  
9 element to another input element corresponding to the other  
10 output element, wherein the other input element originated  
11 the packet.

1 Claim 22 (original): The apparatus of claim 17 wherein the means  
2 for maintaining the outstanding packet counter reset the  
3 outstanding packet counter if it remains non-zero for more than a  
4 predetermined period of time.

1 Claim 23 (original): The apparatus of claim 15 wherein the means  
2 for assigning the packet to a path using path congestion status  
3 information include means for

- 4 - selecting a switch plane having at least one uncongested  
5 path, and
- 6 - selecting an uncongested path of the selected switch  
7 plane.

1 Claim 24 (original): The apparatus of claim 23 wherein the means  
2 for selecting a switch plane having at least one uncongested path  
3 use a round robin discipline.

1 Claim 25 (original): The apparatus of claim 24 wherein the means  
2 for selecting an uncongested path of the selected switch plane use  
3 a round robin discipline.

1 Claim 26 (original): A method for alleviating head-of-line  
2 blocking in an input-buffered switch, wherein the switch includes  
3 a plurality of input modules, each input module including virtual  
4 output queues and virtual path queues, the method comprising:  
5 a) assigning an incoming cell to an appropriate one of the  
6 virtual output queues using cell destination information;  
7 b) providing a head-of-line cell of the one of the virtual  
8 output queues to an appropriate one of the virtual path  
9 queues using path identifier information of the cell;  
10 c) for an input module-to-switch plane link, selecting one  
11 of a number of virtual path queues associated with the link  
12 and having at least one cell; and  
13 d) sending the cell from the selected one of the number of  
14 virtual path queues over the link.

1 Claim 27 (original): The method of claim 26 wherein the path  
2 identifier information of the cell was provided using a dynamic  
3 hashing scheme.

1 Claim 28 (original): The method of claim 26 further comprising:  
2 e) determining whether or not the cell sent over the link  
3 was the last cell of a packet; and  
4 f) if it was determined that the cell sent over the link was  
5 the last cell of a packet, then instructing the virtual

6        output queue to send cells of a next packet to an appropriate  
7        one of the virtual path queues.

1    Claim 29 (original):    For use in a switch, an input module  
2    comprising:  
3        a)    a plurality of virtual output queues for accepting cells;  
4        and  
5        b)    a plurality of virtual path queues for accepting  
6        head-of-line cells from the plurality of virtual output  
7        queues.

1    Claim 30 (original):    The input module of claim 29 wherein the  
2    number of the plurality of virtual output queues equals a number  
3    of output ports of the switch.

1    Claim 31 (original):    The input module of claim 29 wherein the  
2    number of the plurality of virtual path queues equals a number of  
3    paths through a switch fabric of the switch.

1    Claim 32 (original):    The input module of claim 29 wherein the  
2    number of the plurality of virtual path queues equals a product of  
3    (a) a number of switch planes of a switch fabric of the switch and  
4    (b) a number of paths through each of the switch planes.

**Amendments to the Drawings:**

The attached sheet of drawings includes new  
Fig. 13.

Attachment: Replacement Sheet